

LABOR – ASTER

INDUSTRIAL AUTOMATION



RESISTANCE SIMULATOR (for Pt100 too) with separation type SIMULATOR-R

- Conversion of any analog standard into resistance
- Repetition of the input resistance from a RTD sensor for example Pt100
- Accuracy class 0.1%
- At the input additional power supply for a two-wire transmitter
- Measure reading, and setting resistance via the MODBUS RTU protocol by slave or master
- RS485 with galvanic optoisolation
- Input, output, power supply and transmission circuits are separated from one another

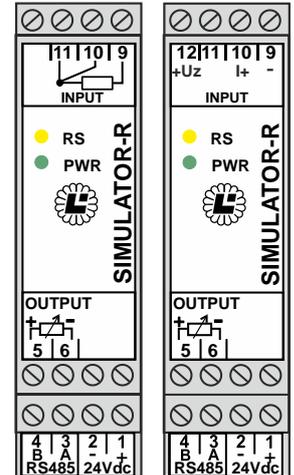
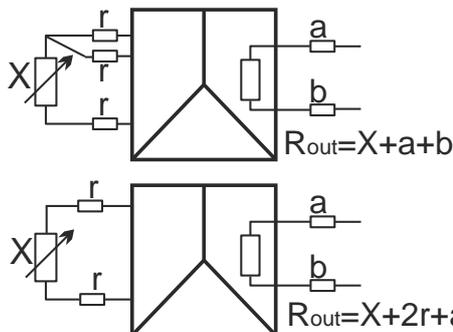
APPLICATION:

Attention: The simulator output must be connected to continuous measurement current source. It cannot be multiplexed. The resistance output is set after 2 sec since the measuring current starts flowing.

The basic purpose of the Simulator-R is to repeat input resistance to output with galvanic separation. Second purpose is to control output resistance by any standard analogue signal. Third purpose is to steer output resistance by the MODBUS RTU protocol. The reading of the measurement and setting of the output can be realized by The MODBUS RTU protocol.

BASIC TECHNICAL PARAMTERES:

- | | |
|--|---|
| Supply voltage | - 24Vdc (21...28V) dc |
| Input | - As ordered, e.g.:
0...20mA, 4...20mA / 50Ω
0...10V / 100kΩ,
resistance sensor Pt100 etc. |
| Auxiliary Uz voltage on input for two-wire transmitter | - 20V/30mA |
| Output | - Resistance 30Ω÷30kΩ |
| Minimum range span for output resistance | - 20 Ω |
| Measure current at output Ip | - as ordered, for e.g. 1mA |
| Voltage given on output Up (limited or extended range when ordering) | - 0.0÷7V |
| Class | - 0.1% |
| Nonlinearity | - (12 bits) ±0.025% |
| Temperature drift | - ±0.005% / °C |
| Connection of Pt100 sensor | - three-wire line |



- | | |
|------------------------------|--|
| Communication connector | - RS485 |
| Transmission protocol | - MODBUS RTU |
| Galvanic separation | - all circuits mutually separated |
| isolation test voltage | - 2kV , 50Hz or equivalent |
| Housing | - 22.5 x 99 x 114.5mm |
| level of security | - IP20 |
| mounting | - on rail TS35 |
| Operating temperature | - 0...55°C |
| Relative humidity | - max 90% |
| Safety requirements | - PN-EN 61010-1:2002 |
| EMC requirements | - PN-EN 61000-6-1
- PN-EN 61000-6-3 |

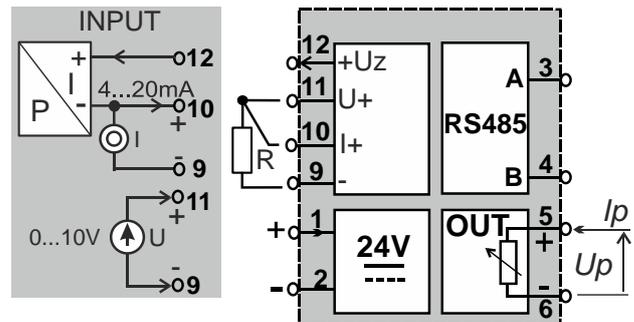


Fig.1 Block diagram, description of simulator R-terminals

Working conditions :

- | | |
|---------------------------------|---------------------------------|
| Ambient temperature for safe | - -30 ÷ +70°C |
| Ambient temperature for working | - -30 ÷ +70°C |
| Relative humidity | - max 90% |
| ambient atmosphere | - dust and corrosive gases free |
| Working position | - all |

HOW TO ORDER :

SIMULATOR-R-(input range)/(output range)-(max measuring current)

For example: SIMULATOR-R-(0-100Ω)/(0-100Ω)-(1mA)

Attention: Information about the maximum possible measuring current is only indicative but it is necessary to complete the order!

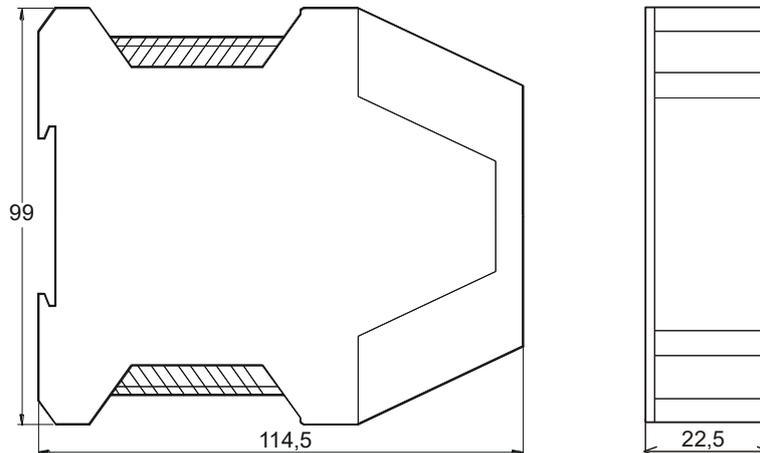


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Description of the program

The program has two basic modes of operation that differ in the state of the RES input signal and 3 states for the resistance simulation. The RES signal is always generated when the unit is turned on and flashes with the power LED. After about 10 seconds, the signal turns off if configuration registers aren't read. Once the signal has been deactivated, it is possible to reactivate it using the program "Labor Programmer". During RES activity, sending any accepted read frame (READ_HOLD_REG {0x03} or READ_INPUT_REG {0x04}) of the MODBUS RTU protocol to the 127 address and register number greater than or equal to 7 results in a refresh time of 10 seconds. When the RES signal is active, the transmission parameters are fixed at 9600 8 N 1 and the device address 127 (0x7F) irrespective of the programmed registers. In this mode it is possible to program the device and write every MODBUS registers.

Program mode (register 15).

- 0 Device simulates resistance from analog input according to the analog primary readings and its settings. The read resistance is written to the initial registers 3 and 4 and it can be used by other devices to retransmit the signal through by the MODBUS RTU protocol. In this case, the register 3 represents the value of read resistance with scale correlation (register 2) and the register 4 has steering value in units of 0.01% (0..10000).
- 1 Device simulates resistance as the signal source is a pair of registers 1 and 2 set from the MODBUS RTU protocol. Device tries to simulate the given resistance. If this is not possible, the resistance closest to that is set. In this case, the limit is only physical capabilities and depends on the correlation of the permissible current and the ability to control voltage of device. Specification of these parameters is included in execution documentation.
- 2 The signal source is another device and register. The value of reading register is scaled by the scaling function according to the values from the relevant registers. Result is saved on the scale 0..10000 to register 4 and then the resistance measured according to the set parameters. Device measures input signal and is available in corresponding register, but its value is omitted in the calculation process.

Scaling function

When reading scaling, you need to specify the device address, registry number, and scaling data as needed. The device performs a mathematical function that scales to the values realized by the device. The scaling result represents the steering value 0...10000. Incorrect setting of the value causes the result to be cut off to the realizable values.

$$result = offset + register * \begin{cases} scale < 0; 1/(-scale) \\ scale = 0; 1 \\ scale > 0; scale \end{cases}$$

Where:
register
scale
offset

Value reading from slave device. 17th register has this number.
Scale is set in 18th register.
Offset for result. Value is read from 19th register.

The Map of MODBUS RTU registers.

Register	~RES	RES ⁱ	Describe
1.	RO RW	RW	The value of the simulated resistor. The value multiplied by the scale register will always result in milliohms. Recordable in simulation mode of resistance and SLAVE MODBUS.
2	RO	RW	Scale register. Specifies the value in milliohms [mΩ] unit in registers 1 and 3.
3.	RO	RW	Resistance value read. The value divided by the previous scale register. The value used for retransmission to the second device and execution control in the resistance simulation mode.
5.	RO	RW	Type of temperature sensor. ⁱⁱ
6.	RO	RO	Calculated temperature with approximation according to standards. The temperature given in 0,1°C eg. 21°C has value 210.
7.	RW	RW	Device address in Modbus space.
8.	RW	RW	Number of stop bits.
9.	RW	RW	Length of byte. Value 8,9. In RES equal 8.
10.	RW	RW	Parity. 'N' (no control) 'E' (even) 'O' (odd). In RES mode It sets to default 'N'.
11.	RW	RW	The youngest register of baud rate. In RES mode It sets 9600.
12.	RW	RW	The oldest register of baud rate. In RES mode It sets 0.
13.	RO	RO	The youngest register of real baud rate.
14.	RO	RO	The oldest register of real baud rate.
15.	RO	RW	Program mode
16.	RO	RW	Device address in Modbus area.
17.	RO	RW	Number of register to read from another device.
18.	RO	RW	Scale for external register reading. >0 multiplier, <0 divisor
19.	RO	RW	Offset.

Attention!

Device has many other registers written and read at other addresses e.g. factory calibration data. Their recording in RES mode may result in the device being calibrated.

For the programming of the device requires "labor.inf" driver installed and program "Labor Programmer" - all for download at www.labor-automatyka.pl. The program was written in bilingual Polish-English version. The driver installation guide for Windows XP, Windows 7 and Windows 10 is available on the website. Below the program window in English version.

ⁱ The power LED flashes when the signal is activated. Always active for 10 seconds. In order to maintain the state, it is necessary to continuously read the parameters from the MODBUS RTU protocol. There is a special function that forces the RES state from the serial interface and is available in the corresponding program.

ⁱⁱ It doesn't always occur. Option available upon agreement.



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